

What is claimed is:

1. An end effector for a robot, comprising:

a plate mounted to the robot, said plate having a first surface and an oppositely positioned second surface;

5 a vacuum port located on the first surface of the plate and passing through the plate to the second surface, said vacuum port being connected to a vacuum source;

10 a surround located on the second surface of the plate, said surround enveloping the vacuum port at the second surface of the plate;

15 a first gripping element mounted to the second surface in substantially perpendicular relationship to the plate, said first gripping element being located outboard the surround;

a second gripping element positioned in spaced parallel relation opposite the first gripping element whereby said second gripping element is located outboard the surround.

2. An end effector according to claim 1 wherein the second gripping element is mounted to a moving means, said means being attached to the plate whereby the second gripping element is positioned within a defined range of motion in relation to the first gripping element.

3. An end effector according to claim 2 wherein the moving means comprises a linear actuator.

4. An end effector according to claim 1 wherein:
the first gripping element further comprises a first blade having a smooth surface, said first blade being rigidly mounted generally perpendicularly to the plate;
5 and

the second gripping element further comprises a second blade having a smooth surface, said second blade being movably mounted generally perpendicular to the

plate.

5 5. An end effector according to claim 1 wherein the surround is positioned on the second surface in a substantially rectangular pattern and whereby the surround forms four substantially perpendicularly arranged walls.

6. An end effector according to claim 1 wherein the surround comprises a subframe, said subframe located between the surround and the plate.

7. An end effector according to claim 1 further comprising a vacuum sensor, said vacuum sensor being mounted to said plate.

5 8. An end effector according to claim 1 wherein the frame further comprises a pair of parallel mounting rails positioned substantially perpendicular to the plate, each of said parallel mounting rails having a plurality of vacuum cups mounted thereon whereby said vacuum cups are adapted to selectively apply a vacuum.

9. An end effector according to claim 1 further comprising a plurality of piercing points said points being retractably mounted to the plate.

10. The end effector of claim 9 wherein said plurality of points is retractably mounted to a mounting arm, said arm being attached to the plate.

5 11. An end effector according to claim 10 further comprising a plurality of suction cups located on said arm whereby said arm is mounted in substantial perpendicular relation to the plate; and wherein each said suction cups has means for drawing vacuum.

12. An end effector according to claim 1 further comprising a plurality of suction cups, said suction cups being mounted in perpendicular relation to the plate wherein said suction cups selectively draw a vacuum.

13. An end effector for a robot for manipulating a container, said effector comprising:

5 a vacuum plenum comprising a mounting plate, a surround mounted to said plate, a port passing through said plate, and a means for drawing vacuum connected to said port;

10 a first gripping element mounted to the plate outboard of said surround, said first gripping element comprising a stationary blade having a smooth surface, said stationary blade being rigidly mounted generally perpendicularly to the plate; and

15 a second gripping element comprising a movable blade having a smooth surface, said movable blade being movably mounted generally perpendicular to the plate outboard of said surround, and wherein said movable blade is positioned opposite the first gripping element.

5 14. An end effector according to claim 13 wherein the stationary blade includes a first smooth surface, said first smooth surface being outboard of the vacuum plenum, said stationary blade rigidly mounted generally perpendicular to the plate;

said movable blade includes a second smooth surface, said second smooth surface being opposite the stationary blade whereby said first smooth surface faces said second smooth surface; and

10 said vacuum plenum is positioned between said first smooth surface and said second smooth surface.

5 15. An end effector according to claim 13 further comprising a plurality of suction cups located in generally perpendicular relation to the plate and wherein said suction cups are positioned to engage the container, said suction devices being connected to a vacuum means.

5 16. An end effector according to claim 13 further comprising a plurality of piercing points, each said point having a barbed portion, said points being retractably mounted to the plate, whereby the plurality of points are adapted to pierce a container.

17. An end effector according to claim 13 further comprising a vacuum sensor, said vacuum sensor mounted to said plate.

18. A system for gripping and transferring items from a container, said system comprising:

a supply of items within said container;

5 an industrial robot with an end effector, said end effector having a plate rotatably mounted to the robot, said plate having a first surface and an oppositely positioned second surface;

10 a vacuum port located on the first surface of the plate and passing through the plate to the second surface;

a surround located on the second surface of the plate, said surround enveloping the vacuum port at the second surface of the plate;

15 a first gripping element mounted to the second surface in substantially perpendicular relationship to the plate;

a second gripping element positioned in spaced parallel relation opposite the first gripping element; and

20 whereby items are gripped by said end effector, removed from said container and transferred to a predetermined location.

19. The system of claim 17 wherein the end effector further comprises a gripping means for gripping and transporting empty containers.